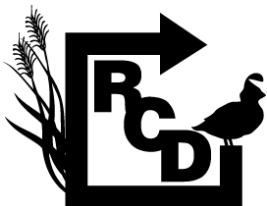


**Final Report**

# **Total Resource Management Outreach Challenge Grant**

**Yolo County Resource Conservation District  
1994-2000**



**June 1, 2001**

**AGRONOMY**



**BIOLOGY**



**DRAINAGE**



**ENERGY**



**WATER MANAGEMENT**



**FARM MANAGEMENT**



**INTEGRATION**



**Yolo County Resource Conservation District  
Total Resource Management Outreach Challenge Grant  
Final Report**

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## Executive Summary

Through a challenge grant from the US Bureau of Reclamation, the Yolo County Resource Conservation District (District) along with four other conservation districts and the California Association of Resource Conservation Districts (CARCD) worked with regional experts and six local growers to determine what form and impact Total Resource Management can have on Yolo County farms. The District selected its cooperators to represent a diversity of cropping systems and geographical locations within the county, including foothill rangelands, an organic walnut orchard, and high-production field and row crops. In October 2000 the District completed the six-year project.

The District worked with cooperating agencies to provide in-depth resource assessments of specific farm sites and recommended integrated practices, provided wide-ranging technical assistance, and offered partial financial support. All stakeholders, especially volunteer farmers, determined the work that took place. Practices implemented as part of the project included tailwater return ponds, insectary hedgerows, range management, irrigation water management, cover crops, and Integrated Pest Management. Staff carefully monitored the implementation and impact of the adopted practices, then compared on-site results with initial resource conservation goals. Data from this monitoring was collected and, when appropriate, refinements of the practices were considered. Findings include:



*Cooperating Growers and RCD TRM Project Manager visiting farm site.*

*Yolo RCD*

- Documented minimum of 40% reduction of winter storm runoff from tomato fields planted with a winter cover crop instead of winter-fallowed. The study also documented increased yields associated with the cover crop that compensated for the cost of cover crop planting and incorporation.
- Documented forage quality of selected species of native perennial grasses on par with that of non-native annual and perennial grass forage species.
- Documented multiple benefits of a vegetated tailwater return pond: 100% tailwater recovery and reuse, sediment capture, groundwater recharge, increased wildlife visitation, and attraction of beneficial insects.
- Documented multiple benefits of a no-till cover crop (in walnuts): improved soil tilth evidenced by reduced cracking, reduced energy expense due to a less bumpy ride down rows, and harbor for beneficial insects.
- Documented high levels of beneficial insects attracted to insectary hedgerows. Recent UC research has found that such insects will move up to 400' (some up to a mile) into a field from an insectary border.

- Discovery of surprising biodiversity on farm sites. Ringtails, assumed to be gone from the valley lowlands, have left tracks at two farm sites. This resulted in a secondary benefit of collaboration with UC Davis wildlife specialists who were excited about the District's unprecedented findings and supported further project monitoring efforts with their own equipment and time.
- Management structure and communication are sometimes the greatest limiting factors in implementing conservation practices on cooperator sites. Disagreements between family members about the values of different practices have delayed their implementation. Unclear communication between the cooperating grower and his workers about the activities on a given field has resulted in planting efforts being sprayed or disked out because they were assumed to be weed patches.

As the projects at each site matured, we developed tours to educate farmers, university researchers, professors, students, agency professionals, and the general public about Total Resource Management. The project cooperators also participated in these outreach efforts by sharing their experiences with other farmers and hosting field days on their farms. District staff gave numerous slide show presentations about the TRM project and resource conservation to groups such as the local Farm Bureau, Rotary Club, university and junior college classes, elementary and high school classes, at for public and special gatherings. Local papers and the agricultural press (journals, newspapers, and radio) also regularly published stories about the project.

The project had a significant effect on the District itself as well as its partner organizations involved in the project which extended far beyond the original scope of work. This demonstrates the potential for leverage that comes with grant funding and agency partnerships and cooperation. Completion of the project required the input of many different partners who shared expertise and resources with the District. This interaction strengthened the District's relationships with various long-standing agency and organization cooperators and fostered new relationships with others and many local farmers. This process served to both increase District staff expertise and skills and improve the District's credibility as a significant contributor in the agricultural and conservation communities. It also benefited our partners by encouraging and supporting them to explore new practices and topics of research. Through the project, District staff generated three on-farm conservation guides--*Bring Farm Edges Back to Life!*, *Know Your Natives*, and *Monitoring on Your Farm*--and built a web site (<http://www.yolorcd.ca.gov/>) that will communicate project-developed knowledge far beyond the grant period.

During the project period, District staff determined that an important next step for the work completed and information gained from this project would be the development of a conservation planning tool that would support farmers who want to best manage their property. Several models exist for the District's vision, namely: the Idaho OnePlan, a similar Michigan project, and the Elkhorn Slough Watershed (Monterey Co., California) one-stop permit process. Staff oversaw research on a variety of conservation planning tools as well as a survey of local farmers' needs and concerns regarding the development of a "OnePlan" for Yolo County. The District refined the concept in partnership with USDA NRCS and USDA Agricultural Research Service personnel and included it in a successful proposal to the CALFED Bay Delta Program in May 2000. With that funding, the District looks forward to continuing and expanding the work begun in the TRM project into the 21st century.

## District Background

The Yolo County Resource Conservation District covers over 500,000 acres (83%) of Yolo County, with terrain varying from 2,500' interior coast range peaks on the far west and valley floor gently sloping across the majority of the county to the Sacramento River on the east. Dominant soils are deep valley alluvium, from clay to sandy loam texture, deposited over time by the flooding of the Sacramento River, Putah Creek on the south, Cache Creek, and other minor drainages. These deep soils support a healthy agricultural economy that generates about \$300 million per year in crop revenues. The top income-earning crops are processing tomatoes, winegrapes, rice, almonds, alfalfa, corn and walnuts. County agriculture is dominated by large family farms, typically over 1,000 acres, but also includes a growing number of small, 10-100 acre operations featuring organic and specialty crops. Irrigation is supported by ground water, the Yolo County Flood Control and Water Conservation District's diversions from Cache Creek, and diversions from the Sacramento River. Many farmers are able to take advantage of the tailwater from "upstream" water users as the water makes its way via ephemeral stream channels (sloughs) and drainage canals to the Yolo Bypass and Sacramento River. Major resource concerns for Yolo County farmers are winter storm drainage and related erosion, noxious weed management, and soil fertility. Within the county there are pockets of saline and alkaline soils (associated with historic settling basins), as well as those with unique nutrient deficiencies that create limitations for some farmers, many of whom leave such areas fallow or in dryland crops. The western hilly and mountainous ground with shallow or rocky soils primarily supports annual rangeland and dryland grains.

The District's mission statement is:  
"The Yolo County RCD is committed to protecting, improving, and sustaining the natural resources of Yolo County. We promote responsible stewardship by:

*Demonstrating* conservation practices through cooperative land users,

*Educating* the public in resource conservation and enhancement,

*Providing* information and expertise."



*Northern harrier hunting along a hedgerow.*

*P. Vilms*

The District's lines of business include: education, land treatment, resource assessment, and future planning. The Board consists of four farmers and one landowner, all of whom actively undertake conservation practices on their ranches and work within the community to promote resource conservation. It is their overriding concern for the degraded quality of wildlife habitat and how improvements can be made in the working farm landscape to promote wildlife in Yolo County that set the tone for the District's Model Farms Project. In 1996, the District produced a video entitled, "Working Habitats for Working Farms" that effectively presents the District's concerns and vision for local agricultural and rural land management.

## Introduction

### Project Initiation

In fall of 1994, the Yolo County Resource Conservation District (District) joined several other RCDs and the California Association of Resource Conservation Districts (CARCD) in the US Bureau of Reclamation (USBR) Total Resource Management Outreach Project Challenge Grant. “Total Resource Management,” as employed by the USDA Natural Resources Conservation Service (NRCS), is an approach to agricultural land management in which *all* resources (physical, social, and economic) are considered in decision-making and conservation plans are made with their complex interactions in mind. A TRM conservation plan contains practices that adequately address all of the resource concerns identified for a given farm.

The BOR had three primary goals in funding this Challenge Grant project:

1. To determine what practices were currently being utilized by growers and whether voluntary adoption of conservation practices to sustain our soil, water, and air resources was a viable alternative to regulatory actions;
2. To determine standard practices and resource conservation techniques in the areas of farm management, energy management, agronomy, water management, biology and drainage; and
3. To develop a series of TRM “model farms” on which multiple conservation practices were implemented for demonstration and evaluation purposes, with outreach geared towards other growers and agencies.

The Yolo County RCD workplan for the BOR Challenge Grant covered each of the areas addressed above with the additional challenge of evaluating TRM planning tools with NRCS. Upon acceptance of the grant, the District Executive Director and Board of Directors, working in conjunction with the District Conservationist for the NRCS Woodland Field Office, hired a full-time Project Manager to implement the project and hire an Evaluation Specialist to design and implement a monitoring program.



*A hedgerow and pond create a wildlife area with minimal impact on the adjacent farming operation.*

*P. Vilms*

## Project Site Establishment

The TRM Project Manager selected farmer-cooperator sites through a survey and questionnaire process that at one point engaged over thirty volunteer farmers. In selecting the final group of growers, he held the following criteria:

1. Crop diversity of Yolo County is represented.
2. Geographical diversity of Yolo County is represented.
3. Existence of soil, water, and biological resource problems on the farm.
4. Willingness of grower to participate for the duration of the project.
5. Availability of resources to the grower to implement suggested alternative practices.
6. Willingness of the grower to use farm as an outreach site.
7. Size of farming operation and sphere of influence of grower.

The project manager finally selected six sites: two row crop growers, one field crop grower, one rancher, one winegrape grower, and one walnut grower. The composition of this group changed in the first year, as two cooperators quit the project to be replaced by others. Another grower was dropped from the project in 1998, as will be described later in the report.

The Project Manager coordinated a series of meetings with specialists in the different cropping systems represented by the selected growers in order to assess the variety of resource concerns that those systems face. With each grower, then, the Project Manager used this information as a basis for conducting site evaluations with NRCS Field Office assistance to determine appropriate project activities. In coordination with NRCS, he then developed Field Office Computing Systems (FOCS)-based conservation plans (see appendix for sample) on each of the TRM cooperator sites. He also developed more graphically-oriented single page plan summaries (see discussion of individual sites, below) for each farm for outreach purposes. During the project period, FOCS was replaced with the NRCS Customer Service Toolkit (CST), which is meant to interface with a Geographical Information System (GIS) to provide more graphical information for NRCS and RCD planners and their cooperators.



*Farm site analysis and planning.*

*Yolo RCD*

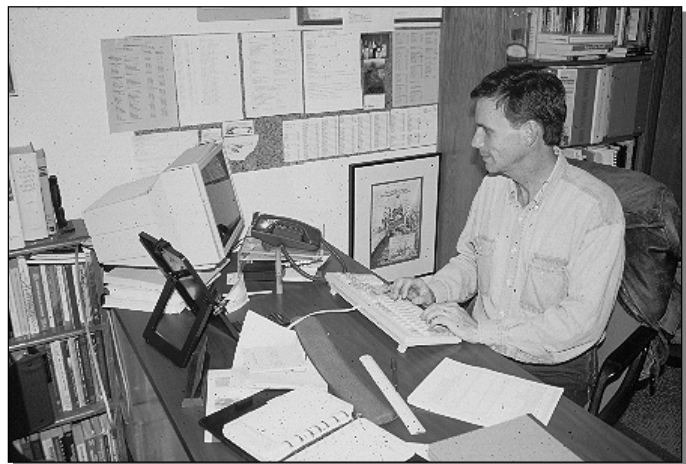
Ultimately, the farmer-cooperators decided what conservation practices were implemented on their farms, and District staff performed the work with their blessing. Such farmer-direction limited the breadth of the project, but it also served as a constraint that reflected the real decision-making issues that conservation-minded farmers must address—concerns such as work load, comfort level, location, and staffing. Practices implemented during the project on the

different sites included: tailwater ponds, cover crops, roadside native grass vegetation, hedgerows, riparian fencing, gully repair, irrigation management, stream channel vegetation, and integrated pest management. Practices were implemented as soon as possible but with deference to the growers' timetables to reduce the potential for conflicts with their respective operations. The Evaluation Specialist researched and applied appropriate monitoring techniques for the different project sites in order to provide documentation of the changes resulting from project implementation. Monitoring techniques included soil, water, and vegetation sampling, surveys, tracking, insect trapping and photomonitoring sites.

## Partnerships

The Yolo County TRM project as well as the statewide project depended heavily on regular input and support from partner organizations, agencies, and individuals. The Yolo County project established a Steering Committee of District board members, local experts, farmers and industry representatives for periodic project review and direction. The project staff developed working relationships with numerous experts in the region, especially from UC Cooperative Extension Specialists and those on the UC Davis campus. County Farm Advisors proved especially helpful throughout the project, initially as advisors and later as project cooperators and collaborators. The Yolo County Flood Control and Water Conservation District (YCFCWCD) and County of Yolo Department of Public Works provided heavy equipment and staff time for earth moving projects for ponds, streambank reshaping, and roadside ditch regrading—work that was beyond the project's budget and expertise.

The District's primary cooperator in this project was the USDA NRCS, which provided not only an office setting and vehicles (when available) for the District, but also regular technical support, access to experts, engineers, conservation program priority, and technology. The relationship between the Yolo County RCD and the NRCS Woodland Field Office is codified in a Memorandum of Understanding (MOU) and is a major factor in the District's functionality. It is so basic to the District's everyday workings that it is unfortunately easily taken for granted.



*Phil Hogan, NRCS District Conservationist for the Woodland Field Office, entering a farm plan into his computer.*

*Yolo RCD*

The Yolo County project also received direction and support from the TRM Technical Advisory Committee (TAC), which consisted of the Project Managers from the various RCDs participating in the project along with the CARCD "Sixth Site" Project Manager. Quarterly or semi-annual meetings with the TAC allowed the different sites to bring each other up to date and share techniques and learning experiences as well as plan overall project direction for statewide activities such as grant-writing, tours and presentations. The other Conservation Districts involved in the project were Cachuma RCD, Pond-Shafter-Wasco RCD, Contra Costa RCD, West Stanislaus RCD, and the Kings River



Conservation District. The Contra Costa RCD left the project in its first year and was replaced by Cachuma RCD. West Stanislaus RCD left the project after three years and was not replaced.

## **Report Format**

The body of the report below is separated into four main sections:

1. Discussion of Model Farm Sites, in which each farm is discussed in turn, with an initial farm description followed by the activities and findings on that farm;
2. “Off Site” Conservation Projects, in which projects that took place off of the model farm sites are described;
3. “Office” Projects, in which planning projects, research and project development activities are discussed; and
4. Discussion of the District’s experience in terms of capacity-building (a CARCD goal), project partnerships and future project directions.

The following discussion of the activities on each farm is framed around the seven resource areas mentioned in the Project Background. After a brief description and summary of activities on each farm, the resource issues are discussed in terms of Problems, Recommendations, and Results. For clarity of discussion, the resource areas as understood in this document are defined as follows:

*Agronomy*--Regular farming practices besides irrigation related to crop and livestock production such as nutrient, pest, range and soil management.

*Biology*--Non-crop biology affected by and affecting the farming operation that includes microorganisms (particularly in soil), insects, animals, and plants adjacent to and within the area being farmed.

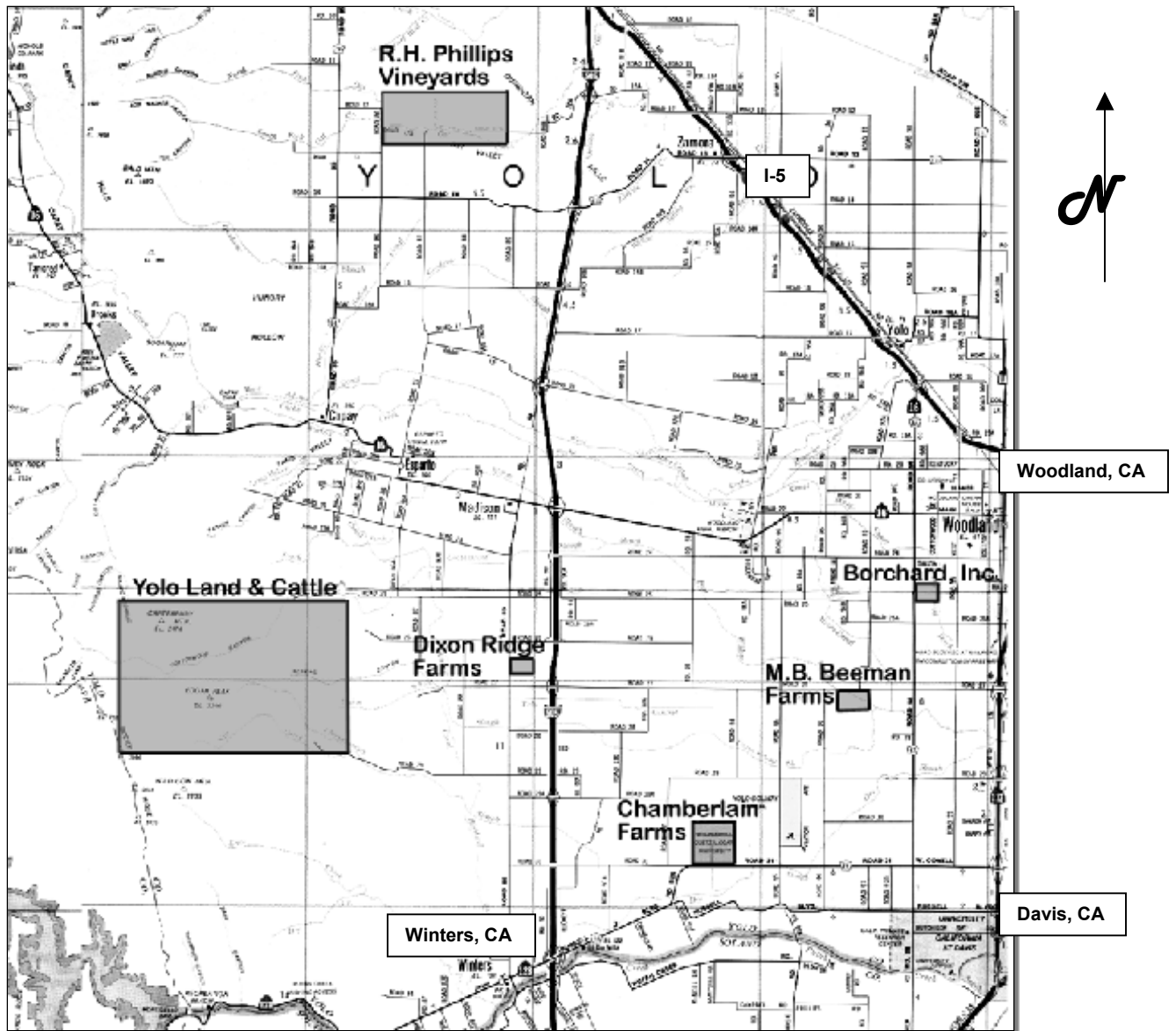
*Drainage*--Water movement (or lack of movement) on and off the farm. In Yolo County, this pertains primarily to flooding from winter storm flows. On the subject farms of the Model Farms Project, concerns of ground water quality are minimal because most of them are either sited on heavy soils or have minimal inputs that could impact ground water quality through leaching.

*Energy*--Inputs of fuel and electricity related to equipment and pumping plant use.

*Water Management*--Efficiency of applied water on field crop and orchard sites and animal water (stock pond and stream) resource management on the range site.

*Farm Management & Integration*--Farm management structure and decision-making process; organizational goals and history; farmers’ values and perceptions of Total Resource Management along with constraints to integration or innovation.

## Yolo County TRM Project Cooperator Site Activities and Results



## Discussion

After all of the fieldwork and projects, what are the products of the Yolo County TRM Project? The summary below shows a much broader impact of the project that extends far beyond the original scope of work and demonstrates the potential for “leverage” that comes with grant funding and agency partnerships and cooperation. The project “products” can be grouped into five categories: project completion, outreach, partnerships, capacity-building, and future funding.

### Project Completion

As stated in the beginning of this report, the primary question guiding this project was: "what forms and impacts can Total Resource Management have on Yolo County farms?" In Yolo County, the forms explored included irrigation water and tailwater management, permanently vegetated wildlife areas on farm "edges," maximizing non-crop vegetative cover for soil stabilization and water quality, and integrated pest management. In terms of the six subject areas defined in this project, we observed the impacts of these and the other practices implemented as outlined below:

#### *Agronomy*

- Through lab analysis, we observed that the forage quality of native perennial grasses rivals that of common, annual dryland range forage species.
- In partnership with industry and University research, we documented effective Yellow starthistle control in a range setting with clopyralid (Transline®) as well as with clopyralid and fertilizer mixed.
- We observed the soil quality benefit of a no-till covercrop in walnuts--soil cracking reduced dramatically enough in four years that harvest equipment could move 40% faster through the orchard.
- We observed noxious weed suppression on field borders that were properly managed with native grass stands. We also observed relative failures in those stands that were not effectively maintained (timely management of weed encroachment in the new plantings during their first three years of establishment).
- Cooperation with a tomato IPM program identified a protocol for indexing insect pest predator presence as well as pest presence in determining when to treat tomatoes with pesticide. In several cases, this meant either delayed or skipped treatments when predator presence was adequate to control the pest.
- During three years of trials with UC Cooperative Extension, we observed consistent 5-10% yield boosts in processing tomatoes with the addition of a winter leguminous cover crop--the increased income associated with the yield boost paid for the cost of cover crop planting, management, and incorporation.

#### *Biology*

- Through our monitoring along with that of UC Cooperative Extension, we observed the large numbers of beneficial insects attracted to native insectary hedgerows planted on field borders.
- Over the life of the project we refined effective vegetation management techniques for native vegetation areas.

- Our monitoring program identified surprising animal biodiversity on farm sites that featured native vegetation plantings or natural areas on their field borders.

#### *Drainage*

- We observed between 40 - 75% runoff reduction during winter storms where a winter cover crop was established on a pre-bedded tomato field compared to where the field was left fallow and pre-bedded.
- We observed 100% irrigation runoff capture and reuse with a tailwater pond return system set at the base of a processing tomato field.
- We began promoting and will evaluate (after the project period) the effectiveness of sediment traps placed at farm ditch outlets into local streams to prevent soil loss and downstream sedimentation.

#### *Energy*

- With the soil quality improvements of a no-till cover crop, the reduced tractor time (moved faster through orchard because of reduced soil cracking) meant reduced fuel costs for the farmer.
- One tomato farmer found that converting from seeding to transplanting ultimately reduced his tractor time (and thereby fuel expense) and hand labor time for weed management--one less cultivation and potentially less herbicide application.
- Pump tests were performed on three sites that used pumps for irrigation. All three called for improvements. One pump was removed entirely and replaced with a gravity flow system; the second was deemed too expensive to change relative to the potential efficiency benefit; and the third still awaits change (farmer needing family approval for change--a very slow process in his case).

#### *Water Management*

- Irrigation evaluations on four of the farm sites recommended potential improvements on two of them. In one case, the farmer increased the number of microsprinklers and lengthened his set times, but still was not able to get adequate moisture for his trees--he intends to convert his system to solid-set sprinklers. In the other case, the farmer increased his siphon tube size as recommended, and RCD staff followed up with smaller scale evaluations, but infiltration on his soils remained problematic.
- Tailwater pond return systems greatly increased the on-farm water use efficiency of row crop farmers using surface irrigation.
- Because of the relatively low cost of surface water (less than \$15/acre foot) in Yolo County, irrigation water efficiency is not a high priority for local farmers.

#### *Farm Management & Integration*

- Management issues had both positive and negative effects in all resource areas.
- Some management conflicts that affected Yolo County project activities were: disagreements among family (father-son, brother-brother, and estate-son); rapid farm expansion; leasing property vs. ownership; financial hardship and a tough economy; urban pressure; farmer-employee communication failures that resulted in damage to planting projects; farmer-PCA relationships; poor stewardship by neighbors (accidental overspray, overdisk, or grazing through a fence).

- Other factors affecting project success included localized flooding and the basic inertia of the agricultural industry in relation to the vegetation management changes that the Yolo County RCD promotes. While we observed individual farmers adopting practices such as hedgerows, stream revegetation, pond development, and roadside grasslands, the great number of other farmers, their laborers, and contractors (PCAs and pesticide applicators) completely unaware of (but not necessarily antagonistic to) the restoration efforts meant that planting sites are sometimes sprayed or disked intentionally or accidentally by well-meaning employees, neighbors, and contractors. The concept that all non-crop vegetation is considered weedy and to be removed is deeply engrained in the agricultural management community and will remain a challenge for the foreseeable future.
- Through research and survey, the District has begun work and located funding to develop a web-based farmer-directed conservation planning tool in cooperation with the USDA Agricultural Research Service. The tool will be initially designed for Yolo County, but will be extendable and adaptable to other regions once refined.

## Outreach

District staff developed communication tools that will extend our expertise to other RCDs, farmers, organizations and agencies well after the close of the project. These consisted of three guidebooks (*Bring Farm Edges Back to Life!*, *Know Your Natives*, and *Monitoring on Your Farm*) and the District website (<http://www.yolorcd.ca.gov/>).

## Partnerships

As a result of successful work and necessary cooperation with local farmers and agricultural industry, the District has strengthened its reputation and relationships in the regional agricultural community. More farmers know about the District and respect its work, and, as a result, more come to the District for input and support. The Yolo County Farm Bureau is an important partner in all of our current projects, and representatives of the agricultural industry consider us a resource for cooperation and conservation expertise.

To implement the project required our cooperation with a broad range of experts and natural resource agencies, organizations and educational institutions. Their expertise was instrumental to proper execution of the project and developing our knowledge base. From these interactions we developed positive working relationships that continued to benefit the project and which support current and proposed work ahead. Correspondingly, many



*Project farmer cooperators visiting the Yolo Land & Cattle Ranch, l-r: Casey Stone, Duane Chamberlain, Jim Borchard, Hand Stone, Paul Robins (RCD staff), Russ Lester, and Michael Beeman.*

*Yolo RCD*

of these relationships provided a benefit to these partners as described below under “Capacity Building.”

A direct benefit of the grant was the opportunity to work directly with the other RCDs in the TRM project. Quarterly TAC meetings allowed us to share our project experiences and developed expertise and provide feedback to each other. Yolo County RCD staff, being new to the world of RCDs, also learned a great deal about how other RCDs function and their realities and constraints. Project staff also interacted with other RCDs throughout the state through workshops, conferences, and researching information. The California Organization of District Employees also fostered these relationships, which will long serve the District for further information sharing and mutual support.

## **Capacity Building**

District staff developed their skill base and expertise through experience and professional development/training opportunities. Considering that much of the project involved exploring “uncharted” territory, there was a considerable amount of on-the-job learning throughout the entire project period. This is evidenced by promotions awarded project staff shortly after the end of the project period (the Evaluation Specialist promoted to Project Manager and the Project Manager to Executive Director).

Through this project and others, the District established itself as a significant contributor in the conservation community. This has improved our apparent legitimacy, and as a result, our appeal to potential funding organizations.

Our partnership with other organizations has motivated and/or enabled them to undertake important new work. These partners include:

- Rachael Freeman Long, UCCE, undertook insectary hedgerow research in partnership with the RCD after the District was awarded funds from the Department of Pesticide Regulation;
- Gene Miyao, UCCE, partnered with project staff in research on the benefits of winter cover crops for processing tomatoes after the District successfully applied for funding from the California Department of Food and Agriculture’s Fertilizer Research and Education Program.
- The State Water Resources Control Board “Grassroots Team” undertook water quality and Best Management Practices research with District staff guidance and support. Their involvement with the District gave them access and acceptance with landowners that they could not have gained otherwise as a regulatory agency.
- The USDA NRCS was encouraged to continue and generate new support for the development of on-line conservation planning tools such as those in Idaho and Michigan. This all serves as groundwork for the California OnePlan.
- The USDA ARS learned about the similarities existing between their research and the District’s work in Yolo County after contact from project staff in 1999. As a result, they developed and initiated a groundwater quality research program in Yolo County perennial grass, conservation tillage, and conventional crop settings.

- The National Audubon Society, California Chapter partnered with the District in developing the CALFED-funded Union School Slough Watershed Improvement Program. The District provided office space, expertise, and critical linkage to local landowners for implementation of the project (now in its second year and gaining momentum).

### **Future Funding**

As a result of all of the above efforts, experiences and relationships, the District was at last successful in competing for grant funds to continue and build upon the work initiated in this project. This funding has been awarded to the District by the CALFED Bay-Delta Program Water Use Efficiency and Ecosystem Restoration Programs to carry and expand project activities into 2004.